Claims 1-4 were rejected under 35 U.S.C. §112, first paragraph, for containing subject matter not sufficiently described and enabled by the specification; Claims 1-4 were rejected under 35 U.S.C. §112, second paragraph, for being indefinite; Claims 1 and 2 were rejected under 35 U.S.C. §103(a) as being unpatentable over either one of Nagase et al. (U.S. Patent 4,894,202, hereinafter "Nagase et al. '202") or Nishino et al. (U.S. Patent 4,927,598) in view of Nagase et al. (U.S. Patent 5,398,269, hereinafter "Nagase et al. '269") and Claim 3 was rejected under 35 U.S.C. §103(a) as being unpatentable over either one of Nagase et al. '202 - Nagase et al. '269 combination or Nishino et al. - Nagase et al. '269 combination as applied to Claims 1 and 2 above, and further in view of any one of Niedrach (U.S. Patent 5,130,081) or Hettiarachchi (U.S. Patent 5,904,991) or Lin (U.S. Patent 5,375,152) or Carter (U.S. Patent 4,526,626).

In response to the objection to the specification, the noted informalities have been corrected herein. However, with regard to Reference Numeral 26, Applicants direct the Examiner to Figure 2, wherein Reference Numeral 26 indicates the pump described in page 17, line 15, of the specification.

With regard to the rejections of the specification and Claims 1-4 under 35 U.S.C. §112, Applicants respectfully submit as follows. The methods of reducing the Ni concentration are described in the specification at page 3, second to third paragraphs. Specifically, the materials for forming the feed water system and/or the reactor system as sources of Ni are changed to an alternate material containing no Ni, the materials are subjected to a preliminary oxidation treatment so as to prevent corrosion, significantly reducing an amount of Ni generated. Further, as described in the specification at page 7, lines 4-11, the main source of iron in the BWR plant is nickel base alloy material, which is used for heat-exchange tubes of a feed-water heater, which serves as the main source of nickel, and for

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the fuel assembly in the inside of the reactor. Accordingly, the application of a preliminary oxidation treatment to the existing material makes it possible to inhibit corrosion and significantly reduce an amount of nickel generated. This makes an amount of iron at least twice as much as an amount of nickel generated.

Similarly, if the Fe/Ni ratio is maintained to (2:1) or more or maintained to the preferred value of zero, Ni concentration cannot be a negative value. The methods of reducing the Ni concentration are the alternation to the material containing no Ni and/or the preliminary oxidation treatment as described above. The methods of reducing the Ni concentration are described in detail in the specification at page 14, line 20, to page 16, line 8, with respect to the following three cases of Ni concentrations: 0.1 ppb; preferably up to 0.4 ppb; and more preferably limited to up to zero. The detailed descriptions show a target value of reduction of Ni generated and a means capable of actually attaining the target value for each case.

The amount of Fe or Ni is an amount which is carried into the nuclear reactor from the feed water system <u>and</u> an amount which is generated in the nuclear reactor. The total amount of Fe or Ni is shown as equation (3) or (4) indicated in the specification at page 14. In this regard, even if the amount which is carried into the nuclear reactor from the feed water system is eliminated to zero, the total amount <u>cannot be zero</u> because a small amount is generated in the nuclear reactor.

Regarding the base for the upper limit of Fe concentration of 0.10ppb in the feed water, the upper limit of Fe concentration of 0.10ppb is an attainable level in accordance with performance of a condensate filter in a BWR plant equipped with the condensate filter and a condensate demineralization tower. In the BWR plant equipped with the condensate filter and the condensate demineralization tower, the concentration of 0.10ppb is a concentration

which can be attained by using a paper filter as the condensate filter used in BWR plant installed in the United States. Also, the concentration of 0.10ppb is a concentration attainable by using a precoated-filter in which powdery resin is densely coated on a filtering surface of the filter so as to exhibit a high performance of removing the minerals such as Fe.

Further, in the BWR plant equipped with the condensate filter and the condensate demineralization tower, the concentration of 0.04ppb is a concentration which can be easily attained by using a hollow fiber membrane filter used as a condensate filter in Japan.

Although the attainable level of the Fe concentration by using the hollow fiber membrane filter is about 0.02ppb, when the carbon steel as a main source of generating Fe is changed to stainless steel or the like having an excellent corrosion resistance, the Fe concentration in the feed water can be a level close to zero, i.e., "the preferred value of zero."

In this connection, when the plant is started-up with a low output power after completion of a periodic inspection with a long period of time, Fe concentration is slightly increased. However, the Fe concentration would not greatly exceed the aforementioned upper limit of 0.10ppb. Since the plant is operated so as to provide a 100% capacity (100%-full power output) in three days, the aforementioned upper limit of 0.10ppb can be satisfied.

Even if the breakage of the fuels or the like occurs, there is no influence on the Fe concentration.

When a newly constructed plant is compared with an old plant, there are some influences for the newly constructed plant due to the construction works and there is a tendency of decreasing the Fe concentration in the feed water as the time passes. However, the Fe concentration would not exceed the aforementioned upper limit. While, even in a case of the old plant, the Fe concentration would not also greatly lowered from the aforementioned upper limit.

As has been explained previously in this remarks, the base for the total amount of Fe or Ni specified in equation of (3) or (4) is described in specification at page 14, and the amount of generated Fe is an easily attainable level in BWR plant equipped with the condensate filter and the condensate demineralization tower.

On the other hand, the amount of generated Ni as specified in equation (4) is shown with respect to a case of a full-cascade type (in which 100% of heater drain water is returned to a main condenser) improved standard plant having an output power level of 1100MWe class which is deemed to be the largest case in which the temperature of the final feed water is 215°C and a hydrogen is not injected into the feed water.

The temperature of the feed water in the improved standard plant is the same as that in ABWR (Advanced BWR). However, a wetted surface area of a feed water heater with respect to a feed water rate in the improved standard plant is larger than that of ABWR, so that the amount of Ni generated becomes large in the improved standard plant, and a dissolved oxygen concentration in the reactor water and the temperature of the feed water are also high.

The amount of Ni depends on various factors such as final temperature of the feed water, the dissolved oxygen concentration in the reactor water, whether the hydrogen injection is performed or not. When the temperature of feed water is high, the amount of Ni generated due to corrosion is increased. The dissolved oxygen concentration ranging from 150 to 250ppb in the reactor water in various types of BWR has no influence on the corrosion rate of a stainless steel, but exert influence on the corrosion of fuel springs. The corrosion rate of the fuel spring is increased as the dissolved oxygen concentration in the reactor water becomes high, and the amount of Ni generated due to the corrosion becomes large.

When the hydrogen injection is performed, the dissolved oxygen concentration in the

reactor water is lowered thereby to suppress the corrosion of the fuel springs, and the amount of Ni generated due to the corrosion becomes low. There is a possibility of slight increase in the corrosion rate of stainless steel in the reactor vessel.

However, the Fe content in the stainless steel is at least twice the Ni content. Therefore, this fact functions as a safer side at a time of determining the limiting value of Fe so as to give a Ni concentration of 0.2ppb or more. Accordingly, the evaluation is performed in the present invention with respect to the countermeasure of reducing the Ni amount required for the safer side corresponding to the target upper limit of Fe concentration in the feed water.

In a 540MWe class BWR in which the temperature of the final feed water is 200°C and the dissolved oxygen concentration in the reactor water is low to be about 160ppb, the Ni concentration in the feed water and the corrosion rate of the fuel springs are 1/2 and 1/5 of those in the full-cascade typed improved standard plant having an output power level of 1100MWe class, respectively.

In view of the foregoing discussions, the specification has been amended to correct obvious errors and be consistent throughout the specification. Therefore, the specification and Claims 1-4 are believed to be in compliance with the requirements of the statute.

Further, Claim 1 has been amended herein. In view of the discussions and amendment presented above, this claim amendment is believed to be supported in the specification, and thus is not believed to add new matter.

If, however, the Examiner disagrees with any of the amendments submitted above, the Examiner is invited to telephone the undersigned who will be happy to work in a joint effort to derive mutually satisfactory solution.

Briefly recapitulating, Claim 1 of the present invention is directed to a method for

controlling water quality in a nuclear reactor, including applying a preliminary oxidation treatment in advance to nickel base alloy material which is used in a feed water heater and a fuel assembly of the nuclear reactor, so that a nickel concentration in the reactor water is maintained so as to be less than 0.2 ppb, making an amount of iron, which is carried into the nuclear reactor and corrosively eluted from structural material within the nuclear reactor into reactor water, at least twice as much as any one of an amount of nickel, which is carried into the nuclear reactor, and an amount of nickel, which is generated in the nuclear reactor, and limiting an upper limit of concentration value of iron in system water supplied into the nuclear reactor to up to 0.10 ppb, the iron being removed by an iron removing device for removing iron from system water supplied into the nuclear reactor.

Nagase et al. '202 disclose a method of controlling the amount of Fe component injected into the cooling water so as to realize Fe/Ni concentration ratio of 2 - 10 in the cooling water when a covering ratio exceeds 100%, for the purpose of inhibiting the radioactive substances eluting into cooling water from the corrosion product on a surface of the fuel rods. However, Nagase et al. '202 do not teach "making an amount of iron, which is carried into the nuclear reactor and corrosively eluted from structural material within the nuclear reactor into reactor water, at least twice as much as any one of an amount of nickel, which is carried into the nuclear reactor, and an amount of nickel, which is generated in the nuclear reactor" as recited in Claim 1.

In Nagase et al. '202, the cooling water is nuclear reactor water flowing along the fuel rod surfaces. In particular, Nagase et al. '202 disclose a method of injecting and adding Fe so that the concentration ratio of Fe/Ni in the nuclear reactor water is set to 2 -10.

In contrast, in the method as recited in amended Claim 1 according to the present invention, the total amounts of the generated Fe and Ni that are carried from the feed water

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system into the nuclear reactor and corrosively eluted from structural material within the nuclear reactor into the reactor water are controlled so as to attain the Fe/Ni ratio of 2 or more. In order to attain the Fe/Ni ratio of 2 or more, the generation amount of Fe is decreased as low as possible, and the generation amount of Ni is also inhibited.

In the controlling method of Nagase et al. '202, however, it is impossible to set the Fe/Ni ratio (in terms of total generation amount of Fe and Ni) to 2 and more, which is a condition as recited in Claim 1 of the present invention for inhibiting the elution of the radioactive substances from the corrosion product on the fuel rod surfaces into the cooling water. The reason of the above impossibility is that there is no quantitative relationship between the Fe/Ni concentration ratio in the nuclear reactor water and the Fe/Ni ratio in terms of total generation amount of Fe and Ni.

As the method of Nagase et al. '202 is a method in which Fe is injected and added into the cooling water, the following disadvantages are raised. The amount of the radioactive substance to be generated on the fuel rod surface is remarkably increased. Therefore, the amount of the elution of the radioactive substances from the corrosion product on the fuel rod surfaces into the cooling water is also increased. In addition, a part of the injected Fe necessarily adhere to also the piping installed outside the reactor core, and radioactive cobalt is taken into the above adhered Fe.

On the contrary, according to Claim 1 of the present invention, since the injection of Fe is not performed, the amount of the radioactive substances on the fuel rod surfaces can be decreased, and the amount of the elution of the radioactive substances from the corrosion product on the fuel rod surfaces into the cooling water is also decreased.

In Nishino et al., in order to decrease the amount of the elution of the radioactive substances from the corrosion product on the fuel rod surfaces into the cooling water, Nishino

et al. disclose a method in which the corrosion product on the fuel rod surfaces is consisted of Ni ferrite and/or Co ferrite each having a small elution rate (dissolution speed). In order to form the Ni ferrite and/or Co ferrite, Fe is injected into the condensate system at a downstream of a condensate purifying facility. In addition, as to decreasing the Fe crud in the feed water to an extremely low level, Nishino et al. describe negative opinions as described in column 1, line 7, to column 2, line 3.

The method of Nishino et al. is accomplished by replacing the Fe/Ni concentration ratio in cooling water in Nagase et al. '202 with Fe/Ni of the corrosion product on the fuel rod surfaces. Because Fe is injected and added to the condensate in the method of Nishino et al., it is quite different from the subject matter recited in Claim 1 of the present invention.

Nagase et al. '269 describes that: the normal method of controlling the Fe/Ni concentration ratio in the reactor water is effective with respect to Co-58, while the amount of Co-60 is greatly increased and the above method is insufficient with respect to Co-60; and in order to solve the problem of the above Co-60, Nagase et al. '269 limit Fe concentration in the feed water to below 0.1-0.05ppb as specified in claims 3 and 4 of Nagase et al. '269.

The method of controlling Fe concentration in the feed water in Nagase et al. '269 is to inject and add Fe into the feed water by taking the Fe/Ni concentration ratio in the feed water and/or an adhesion rate of Fe adhering to the fuel rod surfaces into consideration. The reason (factor) of increasing the Co-60 is that the amount of Fe adhered on the fuel rod surfaces is increased, and an unexpected boiling concentration of chromium oxide or the like is accelerated.

The reason for limiting the Fe concentration in the feed water to below 0.1-0.05ppb in Nagase et al. '269 is to minimize a Co inventory on the fuel rod surfaces. However, the method of Nagase et al. '269 does not secure the Fe/Ni molar ratio of the corrosion product on

the fuel rod surfaces at all. In fact, the Fe/Ni molar ratio is less than 2 as shown in FIG. 2 of

Nagase et al. '269.

Claim 1 according to the present invention is directed to a method in which Fe amount

is reduced as low as possible and the generation amount of Ni is also inhibited, whereby

securing the Fe/Ni ratio of 2 or more in terms of the total Fe generation amount and the total

Ni generation amount that are carried into the nuclear reactor from the feed (supply) water

system and corrosively eluted from the structural material within the nuclear reactor into the

reactor water.

In the method of Nagase et al. '269, the Fe/Ni molar ratio of the corrosion product on

the fuel rod surfaces is less than 2, and Ni amount is excessive; as a result, NiO is

disadvantageously generated on the fuel rod surfaces.

As described in Applicants' specification at page 6 lines 2-4, Co carried into the NiO

is activated to elute again in the form of Co-60, thus increasing concentration of the ionic

radioactivity. To solve the aforementioned problem, Nagase et al. '269 controls pH-value of

the reactor water to acidic side thereby to accelerate the elution of Co and to lower the Co

inventory on the fuel rod surfaces. However, the ion concentration of Co-60 in the reactor

water is about 2 even if the Fe concentration in the feed water is zero. Namely, the ion

concentration of Co-60 in the reactor water is not close to zero unlike the method according

to the present invention. What is worse, the controlling the pH-value of the reactor water to

acidic side necessarily raise a new problem such that the corrosion of the constituting

materials is disadvantageously accelerated or the like.

As is clear from the above comparison, the method as recited in Claim 1 according to

the present invention includes the Fe/Ni ratio of 2 or more in terms of the total Fe generation

amount and the total Ni generation amount that are carried into the nuclear reactor from the

feed (supply) water system having an extremely low Fe concentration and corrosively eluted from the structural material within the nuclear reactor into the reactor water. Additionally, in the method of Claim 1 according to the present invention, the amount of the radioactive substances can be reduced to almost zero without increasing a cost for the treatments. Therefore, the subject matter recited in Claim 1 is distinguishable from those of Nagase et al. '202, Nishino et al. '598 and Nagase et al.'269.

Niedrach and Hettiarachchi disclose an anti-corrosion method in which a material surface is covered (deposited) with platinum group metal or an oxide film composed of an oxide of precious metal. When the material surface is covered with a precious metal at a density amount of about 1 ng/cm$^2$, there can be obtained a sufficient anti-corrosion effect. However, in order to inhibit the general corrosion relating to generation or adhesion of radioactive substances, it is required to completely cover the material surface, for example, like a plating method. However, in the methods of Niedrach and Hettiarachchi, a large amount of expensive precious metal is required to be consumed for performing the covering operation. Consequently, the methods of Niedrach and Hettiarachchi cannot be economically established at all, thus making them unrealistic technologies.

In particular, in a case where the covering film containing the precious metal is applied to the fuel springs serving as a main source of Ni, the covering film is required to exhibit an excellent stability for a long period time, e.g., at least 5 years. However, such a covering film having the excellent stability has not been actually obtained still now. What is worse, the covering films of Niedrach and Hettiarachchi raise a new serious problem such as another localized corrosion which occurs when the covered material is contacted to a different material such as fuel cladding tube having no covering film containing the precious film.

In contrast, according to the method of Claim 1 according to the present invention, a

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preliminary oxidation treatment (a high-temperature atmospheric oxidation treatment) is applied in advance to nickel base alloy material which is used in a feed water heater and a fuel assembly of the nuclear reactor, so that a nickel concentration in the reactor water is maintained so as to be less than 0.2ppb, thereby effectively inhibiting the general corrosion. The fuel assembly including the fuel springs can be economically treated, because the oxidation treatment can be performed by using a normal heating furnace. Thus, it becomes possible to greatly reduce the cost for inhibiting the radioactive substances.

Lin discloses a method in which Fe is injected into the cooling water for reducing the formation of Co-60 contaminated material on the structural members of the nuclear reactor. In the method of Lin, Fe compound is injected and added to the cooling water. However, according to the above method of Lin, not only the Co inventory on the fuel rod surfaces is disadvantageously increased, but also Fe is adhered to the surface of the structural members thereby to disadvantageously increase the contamination of Co-60. Therefore, the effects described in Lin are believed to be highly doubtful.

Carter discloses an anti-corrosion treatment process as a technique for inhibiting the general corrosion by forming a protection film (oxide film) having a thickness of about 2.5 $\mu$m on the alloy containing chromium and cobalt and/or nickel. The protection film is formed by heating the alloy in contact with an alkaline solution containing EDTA and ferrous ions ($Fe^{+2}$). However, since the process of Carter uses the various chemical agents such as alkaline compound, EDTA, ferrous compound or the like, the handling facilities for the chemical agents and the facilities for treating the waste fluid containing the chemical agents are inevitably required, thereby greatly increasing the facility cost and the running cost. Thus, the industrial applicability of the Carter process is quite small. In addition, the aforementioned EDTA is an agent obstructing a cement solidification treatment for

solidifying the waste fluid discharged from the BWR plant, thus being a serious problem.

Furthermore, when taking a stress and distortion applied to a contact portion between the oxide film and the alloy member into consideration, it is said that an upper limit of the thickness of the anti-corrosion protection film capable of exhibiting a high adhesion property and a high stability is about 0.5 $\mu$m. In this regard, the thick protection film in Carter having a thickness of about 2.5 $\mu$m cannot exhibit the high adhesion property and the high stability. Consequently, the Carter process cannot be actually applied to any BWR plant at all.

Additionally, in an embodiment as specified in original claim 4 according to the present invention, a natural zinc is introduced into the reactor water to limit a zinc ion concentration value to up to 5ppb. In general, a natural zinc contains a large amount of Zn-64 which is liable to generate a radioactive Zn-65. Therefore, in these days, Zn which had been subjected to an isotope-separation treatment for separating the Zn-64 has been widely used for BWR plants in the United States. The price of the isotope-separated Zn per unit weight is very expensive like a price of a precious metal. The amount of the isotope-separated Zn used for one BWR plant is about 10kg per year. This high price of the isotope-separated Zn disadvantageously increase the running cost for operating the BWR plant. The required amount of Zn is proportional to Fe concentration in the feed (supply) water. In the method of Claim 4 according to the present invention, the Fe concentration in the feed (supply) water is inhibited to an extremely low level, an addition amount of Zn is quite small and amount of Zn adhered to fuel rod surfaces is significantly decreased. Accordingly, the elution of the radioactive Zn-65 from the fuel assembly into the reactor water can be extremely inhibited even if the natural zinc is used. In this connection, the effect of inhibiting the adhesion of Co is almost proportional to an inverse number of the Zn ion concentration within a range of 1-5ppb of the Zn ion concentration.

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Honda et al. disclose that the stainless steel subjected to a pre-oxidation treatment in a solution containing about 100ppb of Zn at temperature of 100-230°C for 100-1000 hours can exhibit the effect of inhibiting the adhesion of Co so as to reduce the adhesion amount to one-sixth of the stainless steel subjected to the pre-oxidation treatment in pure water. However, the effect of inhibiting the adhesion of Co caused by Zn would not continue unless the Zn ion concentration is normally maintained to a high level. Although Honda et al. specify a wide temperature range from 100°C to 300°C and also a wide concentration range of Zn from 3ppb to 1000ppm as specified in claims 3 and 16 of Honda et al., Honda et al. are quite silent about the use of natural zinc.

In contrast, in the method of Claim 4 according to the present invention, the Zn ion concentration is not controlled by the pre-oxidation treatment but controlled by an amount of Zn introduced into the reactor water during the operation of the BWR plant. Since the Zn ion concentration value is controlled to be up to 5ppb in the method of Claim 4 according to the present invention, the generation of ZnO onto the fuel rod surfaces due to the boiling concentration would not occur at all, and there is no fear of breakage in the fuel assembly. Then, since the Fe concentration in the feed (supply) water is controlled to be an extremely low level of up to 0.10ppb, the method of Claim 4 according to the present invention enables the BWR plant to utilize the cheap natural zinc, thus making it economical and cost saving means. Accordingly, the method of Claim 4 according to the present invention is distinguishable from that of Honda et al.

Midorikawa et al. disclose a method in which a mixture of metal ions comprising two to four metal ions of Mn, Mg, Ni and Zn is added to the cooling water of a water-cooled nuclear reactor so as to inhibit deposition of radioactive substances in the cooling water on the component surfaces. However, since the addition concentration of Zn is limited to only 1

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ppb in Midorikawa et al., the effect of inhibiting the deposition of the radioactive substances in Midorikawa et al. remains to be only about 10% of that of the method of Claim 4 according to the present invention. Accordingly, in the method of Claim 4 according to the present invention, the water quality in a nuclear reactor is controlled by introducing the features that Fe concentration in the supply water is extremely lowered to up to 0.1ppb and the economical natural zinc is injected into the reactor water, so that the effect of inhibiting the adhesion of the radioactive substances can be maximized within the range of the Zn concentration and Fe concentration capable of securing a soundness of the fuel assembly. It is thus believed that the subject matter recited in Claim 4 is distinguishable from Midorikawa et al.
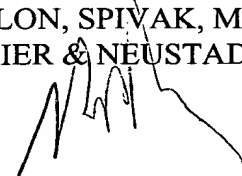
Because none of the cited references discussed above discloses the method as recited in Claim 1, even the combined teachings of these references would not render the subject matter recited in Claim 1 obvious.

For the foregoing reasons, Claim 1 is believed to be allowable. Furthermore, since Claims 2-4 depend directly from Claim 1, substantially the same arguments set forth above also apply to these dependent claims. Hence, Claims 2-4 are believed to be allowable as well.

In view of the amendments and discussions presented above, Applicants respectfully submit that the present application is in condition for allowance, and an early action favorable to that effect is earnestly solicited.

Respectfully submitted,

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## IN THE SPECIFICATION

Please amend the paragraph at page 3, lines 10-20, as follows:

--In the method of the present invention for controlling water quality in a nuclear reactor, an amount of iron carried into the nuclear reactor serving as a source of radioactivity is minimized as much as possible in order to reduce remarkably an amount of $NiFe_2O_4$ adhering on the surface of coated fuel pipes in a fuel assembly serving as a source of ions and radioactivity in the nuclear reactor. An amount of iron contained in system water such as supply water supplied into the nuclear reactor is limited up to 0.10 ppb and preferably up to 0.04 ppb as an upper limit value, and more preferably limited up to zero as closely as possible. In such a case, a nickel concentration in the reactor water is maintained [not] so as to be less than 0.2 ppb.--

Please amend the paragraph at page 7, lines 12-24, as follows:

--According to the present invention, introduction of natural zinc into the nuclear reactor water to limit the zinc ion concentration value to up to 5 ppb, as claimed in Claim 4, makes it possible to cause an amount of $ZnFe_2O_4$ in a place other than the surface of coated fuel pipes to become null. It is also possible to inhibit generation of ZnO on the surface of the coated fuel pipes as well as generation of Zn-65 due to $ZnFe_2O_4$ generated. When the iron concentration value of supply water is 0.04 ppb, it corresponds to 1/10 of iron amount of

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supply water in a domestic BWR plant and 1/50 of that in a BWR plant in many foreign countries. In this case, an amount of Zn-65 generated on the surface of coated fuel pipes comes merely to the same extent as in the case where expensive zinc, [form] from which Zn-64 has been removed, is used in the foreign BWR plants, even when natural zinc is used.--

Please amend the paragraph at page 8, line 25, through page 9, line 7, as follows:

--A remarkable reducibility of an amount of nickel makes an amount of iron generated at least twice as much as an amount of nickel due to existence of ferrite, which is generated through corrosion of stainless steel in the reactor, even when iron concentration of the supply water decreases to become null. In such a case, it is preferable to reduce the iron concentration of the supply water as lower as possible. An iron removing device as claimed in any one of Claims 8 to 11 is required to make the iron concentration of the supply water null. The condition for making an amount of iron generated at least twice as much as an amount of nickel may exist in the intermediate portion between [4] 0.04 ppb as the existing value and zero, depending an extent of reduction in an amount of nickel generated.--

Please amend the paragraph at page 9, lines 20-28, as follows:

--Reduction in an amount of cobalt generated will suffice in order to reduce a clad Co-60 in the reactor water under conditions in which an amount of iron carried is minimized. Under the present circumstances, the Co-base alloys for the turbine blade and the large-diameter valve make up 30% and 40% of the source of cobalt, respectively. Therefore, when the Stellite as [Co] the cobalt base alloy is changed to nickel base alloy [such as Colmonoy] as claimed in claim 13, it becomes possible to reduce an amount of cobalt generated to one fourth thereof in the present circumstances.--

Please amend replace the paragraph at page 13, lines 5-16, as follows:

--In the RWCU system 8, carbon steel is used for system pipes and shells of the RWCU heat exchanger 9. Stainless steel is used for heat exchange tubes of the RWCU heat exchanger 9. Corrosion velocity of the carbon steel during the operation of the plant is twice as much as the stainless steel at the most and wetted area of the carbon steel is less than 5% of the stainless steel. Corroded iron forms $NiFe_2O_4$, like the stainless steel. Amounts of iron and nickel generated in the existing nuclear reactor are shown in the form of concentration value converted into the supply water after achievement of the equilibrium core. Amounts of iron and nickel generated are $12.6t^{-0.5}$ppb [t:EFPH (Effective [Fuel] <u>Full</u> Power Hour)] and $(3.4t^{-0.5}+0.04)$ ppb (t:EFPH), respectively. Here, "0.04" is a contribution to generation from the fuel springs of Ni-base alloy.--

Please amend the paragraph at page 14, lines 6-9, as follows:

--In the existing system, the iron concentration of the supply water of about 0.04 ppb is maintained. In the existing system, the contribution rates of the first, second and third [routs] <u>routes</u> are 50%, 30% and 20%, respectively.--

Please amend two paragraphs at page 14, line 20, through page 15, line 3, as follows:

--Accordingly, the total amount of iron and nickel in the form of concentration value converted into the supply water can be expressed as follows:

Total amount of iron generated in the from of concentration value converted into the supply water

$= 0.04 + 12.6t^{-0.5}$ (t: EFPH) . . . . . . . . . . (3)

Total amount of nickel generated in the [from] <u>form</u> of concentration value converted into the

supply water

$$= 0.04 + 12.6t^{-0.5} + 3.4t^{-0.5} \text{ (t: EFPH)} \ldots \ldots \ldots (4)$$

The first term [of] <u>on</u> the right-hand side in the formula (3) is an amount of iron

carried from the supply water system 1 into the nuclear reactor 2 and the second term thereof

is an amount of iron generated mainly from the stainless steel in the reactor.--


## IN THE CLAIMS

Please amend Claim 1 as follows:

1. (Amended) A method for controlling water quality in a nuclear reactor comprising

the steps of:

<u>applying a preliminary oxidation treatment in advance to nickel base alloy material</u>

<u>which is used in a feed water heater and a fuel assembly of the nuclear reactor, so that a</u>

<u>nickel concentration in the reactor water is maintained so as to be less than 0.2 ppb;</u>

making an amount of iron, which is carried into the nuclear reactor and corrosively

eluted from structural material within the nuclear reactor into reactor water, at least twice as

much as any one of an amount of nickel, which is carried into the nuclear reactor, and an

amount of nickel, which is generated in the nuclear reactor; and

limiting an upper limit of concentration value of iron in system water supplied into the

nuclear reactor to up to 0.10 ppb<u>, said iron being removed by an iron removing device for</u>

<u>removing iron from system water supplied into the nuclear reactor.</u>